DISCIPLINE SHEET

1. Information regarding the programme

1.1 Higher education institution	Babeș-Bolyai University of Cluj-Napoca
1.2 Faculty	Environmental Science and Engineering
1.3 Department	Environmental Analysis and Assesment
1.4 Field of study	Environmental Engineering
1.5 Study cycle	Bachelor
1.6 Study Programme / Qualification	Environmental Engineering

2. Information regarding the discipline

2.1 Name of the discipline	Technologies for water management and treatment						
2.2 Course coordinator			Assistant Prof., PhD Manciula Dorin				
2.3 Seminar coordinator			Assistant Prof., PhD Manciula Dorin				
2.4 Year of study	4	2.5 Semester	7	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 Laboratory / Seminar 3.4. Project	2
3.5 Total hours in the curriculum	56	Of which: 3.6 course	28	3.7 Laboratory 3.8. Design	28

Time allotment:	Hours
Learning using manual, course support, bibliography, course notes	20
Additional documentation (in libraries, on electronic platforms, field documentation)	20
Preparation for seminars / labs, homework, papers, portfolios and essays	20
Tutorship	6
Evaluations	2
Other activities: visits, workshops, and other academic activities	2

3.7 Total individual study hours	70
3.8 Total hours per semester	126
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1 Curriculum	• unit operations and chemistry.
4.2 Competencies	• basic notions of chemistry and engineering, information and documentation, teamwork, use of computer technologies for data acquisition and processing.

5. Conditions (if necessary)

5.1 For the course	• lecture room (50-60 seats) with video projector.
5.2 For the seminar / laboratory activities	• laboratory D.0.2., equipped with water, electricity, glassware, specific equipment, work and protective equipment.

6. Specific competencies acquired

Professional competencies	• developing teamwork skills, relational thinking and finding concrete ways to approach and solve specific environmental problems at different levels of analysis (global, regional, local); • critical analysis, application of models, theories and the use of notions in the field of fundamental sciences and engineering to address the specific problems of environmental knowledge and protection; • explaining and interpreting properties, concepts, approaches, models and notions related to the fundamental and engineering sciences; • presentation of projects related to engineering fields; • recognition and description of elementary concepts, theories, methods and models relating to the basic sciences and engineering sciences.
Transversal competencies	• identifying and complying with the norms of ethics and professional deontology, assuming responsibilities for the decisions taken and the related risks; • identifying roles and responsibilities in a multidisciplinary team and applying techniques for relationships and effective work within the team; • efficient use of information sources and resources for communication and assisted professional training (Web portals, Internet, specialized software applications, databases, online courses, etc.), both in Romanian and in an international language; • description, analysis and use of concepts and theories in the fundamental scientific fields (mathematics, physics, chemistry) and in the field of engineering sciences; • description, analysis and use of concepts and theories in the economic-managerial field applied in the field of the environment.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• familiarizing students with aspects of water management and water resources management; • knowledge of production technologies and ways of supplying drinking water to localities; • knowledge of wastewater treatment technologies resulting from various anthropogenic activities; • knowledge of the ways to limit pollutant emissions from diffuse sources of water pollution.
7.2 Specific objectives of the discipline	• development of technical skills for the quantitative assessment of environmental impacts; • development and implementation of concepts related to the application of best available techniques in terms of water resources management.

8. Contents

8.1 Course	Teaching methods	Remarks
Course 1. Water management. General and introductory notions. The role and importance of water. Categories of waters. Water use. Water resources. Water use and socio-economic development.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 2. Ramnifications and the object of water management. Water balance. Water management works for uses. Management of high waters.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 3. Links between water management and treatment technologies and other technical disciplines. Quantitative and qualitative management. Water resources and requirements. The situation on the globe and at the national level.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 4. Exploitation of water management facilities. Sustainable development in the field of water. Economic and legislative aspects. Economic mechanism and economic instruments. European and national water policies.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 5. Mineral waters. Exploitation of mineral waters. Composition of mineral waters. Properties, indications and contraindications. Water treatment. Drinking water quality criteria. Waterborne bacteria, helminths, viruses and protozoa. Microbiological indicators of water quality.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 6. Uniform processes in water treatment. Decanting of discrete and colloidal particles, flotation. Obtaining drinking and industrial water. Conventional treatment (retention on grates, filtration, sand removal, sedimentation, coagulation-flocculation, salt removal, disinfection).	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 7. Obtaining drinking and industrial water. Advanced water treatment (aeration-oxidation, semi-permeable membrane processes, activated carbon adsorption, dissolved air flotation, change in the concentration of flower in the water). Case studies: treatment of groundwater by aerobic and anaerobic processes and those with high hardness.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 8. Technological processes of water treatment. Case study: surface water treatment, (conventional and combined processes) and technological treatment processes to obtain industrial water. Reducing water consumption in technological processes. Case study: the technological process of papermaking.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 9. The influence of anthropogenic activities on water resources. Water pollution. General aspects. Types of pollution. Pollutants. Sources of water pollution and their classification. Wastewater. Environmental standards in the field of water quality.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 10. Reducing pollution through the treatment and recirculation of industrial effluents. Wastewater monitoring. Unitary processes in water treatment and purification. Wastewater treatment methods.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional

Course 11. Physical purification processes. Gravitational separation, flotation, filtration, centrifugation. Membrane separation. Classification of membranes. Membrane structure. Osmosis and reverse osmosis. Micro filtration and ultra filtration. Electrodialysis.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 12. Unitary processes with transfer between phases. Liquid-liquid extraction. Stripping. Distillation and rectification. Foaming. Adsorption. Freezing.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 13. Chemical purification processes. Neutralization. Chemical reduction and oxidation. Precipitation. Coagulation and flocculation. Ion exchange. Advanced purification. Removal of nitrogen compounds and phosphorus.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional
Course 14. Biological processes. Aerobic processes and anaerobic processes. Disinfection. Establishing the degree of purification. Technological schemes of purification. Sludge management. Features. Preliminary treatments. Sludge stabilization. Dehydration. Incineration. Composting. Sludge recovery.	Interactive lecture, problematization, learning based on case studies and problems.	Attending the course is optional

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8.2 **Project** (1 hour/week.) and **lab** (1 hour/week.)	**Teaching methods**	**Remarks**
Project 1. Presentation of the project topic and its structure Presentation and organization of laboratory teaching activities by laboratory reports / papers and work groups. Labor protection norms in the laboratory of water management and treatment technologies.	Conversation, interactive lecture, problematization, learning based on case studies.	Attendance at design activities is mandatory.
Project 2. Elements of a water supply system. General layout of the components of a water supply station. Water demand and requirement. Characteristic flow rates and calculation elements. Coefficients of daily and hourly variation. Dimensioning and verification flow for system objects and for the development of localities.	Conversation, interactive lecture, problematization, learning based on case studies, exercises, calculations.	Attendance at design activities is mandatory
Project 3. Operation of water supply systems. Logic schemes and block schemes. Series, parallel and alternative connections. Calculations on the safety	Conversation, interactive lecture, problematization,	Attendance at design activities is mandatory

assessment of a water supply system. Causes of insufficiency in the operation of a water supply system. Basic principles in the development of the technological treatment process for obtaining drinking and industrial water. Treatment processes for obtaining drinking and industrial water.	learning based on case studies, exercises, calculations.	
Project 4. Restraint on grates. Elements of technological design of the sand removal basin, sedimentation equipment and coagulation-flocculation equipment. Equipment and ways of filtration, salt removal and water disinfection. Methods of storing and distributing water to consumers.	Conversation, interactive lecture, problematization, learning based on case studies, exercises, calculations.	Attendance at design activities is mandatory
Project 5. Sewerage systems and networks. General elements of sewerage network design. Drawing up a general scheme for a city wastewater treatment plant. Mechanical, biological and advanced wastewater treatment. Disinfection. Sludge treatment.	Conversation, interactive lecture, problematization, learning based on case studies, exercises, calculations.	Attendance at design activities is mandatory
Project 6. Calculation of the degree of purification required in terms of suspensions, BOD_5, oxygen, pH and toxic substances. Assessment of the environmental impact of a wastewater treatment plant. Environmental problems due to water pollution.	Conversation, interactive lecture, problematization, learning based on case studies, exercises, calculations.	Attendance at design activities is mandatory
Project 7. Calculations regarding the discharge of wastewater into the emissary. Self-purification of watercourses. Completing calculations, sketches and drawings.	Conversation, interactive lecture, problematization, learning based on case studies, exercises, calculations.	Attendance at design activities is mandatory
Laboratory 1. Measurement of the physicochemical indicators of water with the help of conductometric methods. Use of multi-parameter analyzer type measuring equipment.	Experiment	Attendance at practical activities is mandatory.
Laboratory 2. Sedimentation of water suspensions.	Experiment	Attendance at practical activities is mandatory
Laboratory 3. Determination of the hardness of wastewater and natural waters.	Experiment	Attendance at practical activities is mandatory
Laboratory 4. Determination of turbidity of water samples by means of optical analysis instruments.	Experiment	Attendance at practical activities is mandatory
Laboratory 5. Monitoring and phenomenological description of the domestic wastewater treatment process in the pilot station. Disinfection and elimination of some organic pollutants.	Experiment	Attendance at practical activities is mandatory
Laboratory 6. Analysis of water samples by determining chemical elements and pollutants by spectrophotometric method.	Experiment	Attendance at practical activities is mandatory
Laboratory 7. Laboratory colloquium	Examination	Attendance is mandatory.
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9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course, practical work and project present examples of calculation, case studies, problems and exercises in order to familiarize students with a series of qualitative and quantitative evaluations of various types of materials, the effects they bring to the environment, especially on water resources.

10. Evaluation

Type of activity	**10.1 Evaluation criteria**	**10.2 Evaluation methods**	**10.3 Share in the grade (%)**
10.4 Course	Theoretical knowledge acquired	Written exam	60 %
10.5 Laboratory / Project	6 experiments in the laboratory	Grading each practical work (experiment) executed in the laboratory	20 %
	7 stages of project implementation	Grading the project and the problems solved	20 %
10.6 Minimum performance standard			
• participation in at least 80 % of the practical laboratory work (5 practical works out of 6) and timely delivery of laboratory reports;			

- participation in at least 80% of the project implementation stages (6 stages out of 7) and submission of individual assignments on time;
- obtaining a grade of 5 in the laboratory colloquium and a grade of 5 in the exam.

Date	Signature of the course coordinator	Signature of the seminar coordinator
04.12.2024		

Date of approval	Signature of the head of department
.....	.....